

COST *and* MANAGEMENT

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• EDITORIAL •

The Inflation Danger

The proposal to grant children's allowances to workers in an effort to halt the inflation trend is meeting a very hostile reception even from labour unions which seems rather difficult to understand as these were the people who were expected to be very much in favour of anything which might alleviate the lot of the lower paid worker.

Labour seems to take the view that nothing but constantly increasing wages will be satisfactory and there is no question but that our whole price control structure is in danger if not of a complete collapse, then of a very serious dent in its armour. This would indeed be a calamity and the people it would hurt most are the people who are responsible for the constant effort to increase wages and thereby pull the props from beneath our price structure.

Few people doubt that there are still very serious inequalities in our wage structure among the lower paid workers. Some time ago, we stated that wages should have been equalized before they were frozen but it is too late for that now and so long as the Government will authorize blanket increases in pay because of the threats of labour unions which threaten to strike and which are big enough to dislocate our war production by so doing, then so long will our whole price control structure be in danger of collapse and inflation come nearer.

It is difficult to know exactly what to do but we have been impressed with a suggestion that lower paid workers be either exempt from income tax or the rates to such persons be reduced. This would be in fact an increase in pay for those lower paid workers without endangering price structure. It has been argued that by so doing the Government would lose considerable revenue from income taxes which would have to be met by either increasing the rates in the higher paid brackets or by some other means. This is quite true but if increases in pay are continually handed out, it means not only will our price structure be endangered but also considerable more money will have to be found because of the increased cost of our war effort due to increases in cost.

It seems to us that the suggestion we have outlined is by far the lesser of the two evils and if the suggestion were followed out and all wages then definitely and absolutely frozen, we believe it will be possible to maintain our present system of price control and thus avoid inflation. It should be noted, however, that we suggest that all wages should be definitely frozen and that the Government should take strong steps to see that such a freezing order is rigidly carried out.

Appeasement never got anyone anywhere except in the soup and that is just where it will end this or any other Government.

There is another matter in this connection of which we believe requires

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some revision. Workers are granted a cost of living bonus in accordance with the increase in the price of living and yet this bonus is subject to deduction for income tax. The amount received, therefore, does not nearly coincide with the increase in the cost of living and this again is a sore point with the average worker.

It seems to us if the Government were to abolish income tax deduction from cost of living bonus and either eliminate all together or drastically reduce the rate on the low increase brackets, they would go a long way in the present difficulty of maintaining price control.

Across the Secretary's Desk

Since the last issue of "Cost and Management", I have had the opportunity of attending three functions in connection with our Society which have given me much inspiration for the future.

The first was the Annual Golf Game and get-together of the Hamilton Chapter and it was a honey. Not only was it well attended but the spirit of the gathering was something to be remembered. Certainly it was the best yet of many such gatherings.

The next was a conference with the directors of the new Bay of Quinte Chapter at Belleville. There are real plans in the making for this Chapter which promises to be a real live one.

The other function was one which gave me real inspiration. It was a dinner and get-together of the Toronto Chapter—Student Section, and it was a grand affair. Between forty and fifty students were present in addition to myself and Charlie Warnes, the latter representing the Toronto Chapter.

The boys were very enthusiastic, asked numerous questions on educational matters and frankly, the Toronto Chapter is indeed fortunate in possessing such a strong, virile body.

It augurs well for the Society generally and the Toronto Chapter in particular and is an object lesson for other Chapters.

The only kick I have to make is that Grant McKnight got me on my feet before dessert was served and for all I know mine is still there.

During the past month I also had the pleasure of a visit from the Chairman of our Edmonton Chapter, Mr. J. E. Tupper, who was in this vicinity and we had quite a chat.

There are big things brewing for the Society in Alberta and possibly also in B.C. which should mature before the end of the year.

Considerable interest is being evinced in both the Lecture and Correspondence Courses of The Society of Industrial and Cost Accountants of Ontario and if you know of any person wishing to study these courses, have him get in touch with me or let me have his name.

The various Chapters will shortly commence the new season. May I impress upon all members the extreme importance of attending such meetings. It is necessary that attendances be good in order to secure good speakers, but more to the point it is necessary to members, themselves, for their own benefit, that they attend regularly.

R. D.

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Literature Received

Credit as a Variable Factor in Industry.

Aust. Acct., July.

A most valuable article on a subject often lost sight of in connection with Accounting methods.

A Revaluation of Cost Accounting.

Aust. Acct., July.

A really fine article and a decided addition to literature on this subject.

Business Budgeting with a View to Conversion from Wartime to Peacetime Conditions.

N.A.C.A., Aug. 1.

A most excellent article dealing with Post War Planning in Industry in a practical manner.

Establishing Control of Factory Overhead.

N.A.C.A., Aug. 15.

Another excellent article on a most vexing problem. One which all Cost and Industrial Accountants would do well to read and digest.

Do Standard Costs Aid War Production?

N.A.C.A., Sept. 1.

Often we hear the statement made that Standard Costs are of no use in wartime. The author of this article disposes of this and other theories in relation to standard costs.

How Change-Over to Product Layout Cut Unit Costs.

Factory, Sept.

A short but informative and illustrated article of real interest.

Foremen's Budgets Save 20%.

Factory, Sept.

Another short but informative article illustrating the value of Foremen's Budgets.

The Heron Estimating Table for Lathe Work.

The Heron Lathe Estimating Chart is a simple and concise set of instructions for time study men and Industrial Engineers and should be in the hands of all such men. It can be purchased for the sum of \$1.00 per copy from Raymond Heron, 91-18 183rd Street, Jamaica, 3, New York.

Educational Courses

The various Universities of Ontario by arrangement with The Society of Industrial and Cost Accountants of Ontario will conduct both Lecture and Correspondence courses in the various subjects to prepare candidates for examinations leading to the degree of R.I.A.

Lecture courses are available in Toronto, Hamilton, London and Windsor.

Full information regarding these courses and registration forms can be obtained from the Secretary at 601 MacKay Building, 66 King Street East, Hamilton, Ontario.

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Quebec Examination Results

The following are the names of students who were successful in passing recent examinations under the Cost and Management Institute of Quebec:

Fundamentals of Cost Accounting—

L. W. Blane	L. V. Gilbert
R. E. Boutin	H. Legault
J. Brunelle	G. Newington
R. Cardinal	R. J. Overall
R. A. Chislett	R. Pouliot
V. Davies	A. Stanfield
J. Deschenes	B. F. Wood

Advanced Cost Accounting—

R. A. Chislett	H. Legault
V. H. Kynch	F. Rheault
F. J. Lagadec	

Organization and Industrial Management—

J. A. Blouin	F. Rheault
S. J. Cooper	L. E. Smart
H. Legault	

Industrial Legislation—

V. Davies	J. R. Nadeau
L. V. Gilbert	R. Pouliot
H. Legault	L. E. Smart

Supplementary Examinations

The Society is constantly receiving inquiries concerning the possibility of supplementary examinations being held some time during the coming fall or winter. Members who desire to write such examinations should immediately notify the Secretary at 601-602 MacKay Building, 66 King Street East, Hamilton, Ontario, stating which examination they desire to write in order that we may determine whether or not there is sufficient call for any or all of these supplementary examinations.

New Members

Montreal Chapter.

- D. Bertrand, C.G.A., Ludger Duchaine Inc., Que.
L. P. Duchaine, C.G.A., Ludger Duchaine Inc., Quebec.

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Paul L. Boutet, Oil Controller for Canada, Quebec.
Paul H. Dorval, C.G.A., Frs. Jobin Inc., Quebec.
J. S. Gosselin, Treasury-Cost Section, Quebec.
W. R. Donovan, C.G.A., Samuel Osborn (Canada) Ltd., Montreal.
J. Belanger, L. Belanger, C.P.A., L.C.M.I., Montreal.
J. D. Allard, Montreal.
R. P. Ouellette, United Shipyards, Montreal.
J. R. Gavin, Dominion Arsenal, Quebec.
R. Guimont, Frs. Jobin Inc., Quebec.
C. A. Roussin, C.G.A., Charte, Samson & Co., Quebec.
G. Tremblay, Gauthier & Tremblay, Chicoutimi, Q.
Marc Boyer, Quebec Bureau of Mines, Quebec.
F. T. Ring, Aluminum Co. of Canada, Arvida.

Toronto Chapter.

S. Queen, Research Enterprises Ltd., Toronto.
S. W. Duxbury, Gurney Foundry Co. Ltd., Toronto.
Barry E. Jones, Toronto Police Dept., Toronto.

Hamilton Chapter.

C. J. Smith Mercury Mills Ltd., Hamilton.
S. McFarlane, Mercury Mills Ltd., Hamilton.
D. F. McNamara, Steel Co. of Canada Ltd., Hamilton.
J. Lowes, Glendale Spinning Mills Ltd., Hamilton.
W. W. Henderson, Meakins & Sons Ltd., Hamilton.
W. J. Jones, Noury Aircraft Ltd., Hamilton.
G. O. Harris, The Tuckett Tobacco Co. Ltd., Hamilton.
J. J. O'Flanagan, Canadian Sullivan Machinery Co. Ltd., Hamilton.
D. A. Curry, Irvington Varnish & Insulator Co. Ltd., Hamilton.
C. H. B. Craft, Dept. National Revenue, Income Tax Dept., Hamilton.
S. Oue, The Inrig Roofing & Sheet Metal Co. Ltd., Hamilton.

Ottawa Chapter.

Philip T. Hart, The Ontario Hughes Owens Co. Ltd., Ottawa.
A. E. Brown, Ottawa Car & Aircraft Ltd., Ottawa.

Toronto Chapter.

Phil Glanzer, 1192 Avenue Road, Toronto.
E. S. Chambers, Trang Co. of Canada Ltd., Toronto.

Hamilton Chapter.

M. N. MacKenzie, Dominion Foundries & Steel Ltd.
Wm. Brennan, Dept. of National Revenue, Income Tax Division.
G. W. Jones, Dept. of National Revenue, Income Tax Division.
J. M. Borthwick, Dept. of National Revenue, Income Tax Division.
N. Rainvasser, Steel Co. of Canada Ltd.
G. H. Walsh, Steel Co. of Canada Ltd.
Miss Helen M. Edwards, Steel Co. of Canada Ltd.
Miss Marie T. Hancox, Craft Wartime Industries.
H. Jones, Dominion Glass Co. Ltd.

Windsor Chapter.

T. W. Chisholm, Treasury-Cost Division, Ottawa.

Costs in the Glass Bottle Industry

Submitted by D. W. COOMBE

The following paper will attempt to outline the methods used in the Glass Bottle industry, to determine the standard cost of each gross of bottles produced. Included will be the method of cumulative actual costs with a view to setting standards, applying such standards to actual ware produced, and the determining of variances. Also, some details of a budgetary control system will be discussed.

We shall deal with a glass house producing, with automatic machines only, all types of commercial ware, from part-ounce capacity to gallon measure. Some examples are small perfumes, drug containers, prescription ware, food packers, ginger ale, beer and liquor containers, milk bottles, and all types of general purpose wear.

A brief outline of the method of manufacture would be in order. The batch of raw materials, consisting chiefly of sand, soda, lime and various chemicals are mixed in their correct proportions automatically in the batch storage and mixing department. From there the mixture is conveyed to the melting furnaces into which it is fed. The furnaces are maintained at a high degree of temperature and the batch materials attain a molten state. The molten glass is drawn from small openings in the feeders at the front end of the furnace and dropped in desired weights into the blank moulds of the automatic machines. Certain operations are performed on the glass in the blank and finishing moulds by use of compressed air, etc., and in a short time the formed bottle is deposited on a conveyor. Bottles are produced, depending on their size and shape, as rapidly as one hundred per minute. The formed bottle is conveyed to the annealing chamber or lehr in which it attains its final strength. At the far end of the lehr the ware is sorted, selected, and finally packed into suitable containers in which the bottles move by means of conveyors or electric trucks to the storing and shipping department.

In order to supply the demands for steam and electrical power, such departments as the Boiler Room and Power House are maintained as well as a Repair or Maintenance Department.

The above outline should be a help or guide in following the costing methods which will now be described.

Actual costs are accumulated four weekly in the factory cost ledger, a sample sheet of which is enclosed.

Let us first deal with department No. 1, the Steam System, a service department. In this department are included the cost of purchased water, the wages of the boiler attendants, the supplies and expense incurred, and repairs of steam boiler equipment. The accumulated cost is distributed, according to the consumption of steam, to Building Heat, to Furnace Department, as steam is used to atomize the fuel oil used to heat the furnaces, to the Machine Department and to the Packing Department for washing and testing. Different percentages are used to apply the cost of this section to Building Heat for winter and summer but the percentages for the processing departments are fairly constant.

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Our next department No. 2, is the General Systems, also a service department. Included is the cost of purchased electricity and the wages of the Power Plant attendants. Also the supplies and expense incurred and the cost of repairs to the various systems such as electric power, compressed air, vacuum, wind and water systems. The whole cost is distributed on the basis of the horse-power hours used per week in each department. By checking the horse-power rating of each motor, and the normal length of time in operation per period, charts are set up by the Engineering and Cost Departments showing percentages for each department at varying capacities. Lighting is charged to the general factory department, and no attempt is made to distribute it to the various centers.

Our next department No. 3, is a direct center and deals with the cost of batch materials. The center includes the laid-down cost of all raw materials entering into the batch and the unit of measure is per 100 lbs. of ware packed. Credit is given at a predetermined standard for cullet reclaimed from the Forming and Selecting Departments.

Department No. 4 is another direct center and is known as the Batch Mixing Department. Included is the cost of unloading all batch materials, the labor of mixing and delivering batch, collecting and preparing cullet, and cost of small tools, supplies and expense, and repairing Batch Department machinery and equipment. The total cost is measured by the same unit as the batch material center, per 100 lbs. ware packed.

Department No. 5 is the Furnace Department, and is also a direct center. The principal item of cost is the fuel used, usually either gas or fuel oil. Also included are the wages of the furnace attendants, the cost of water used in cooling jackets on the furnaces, small tools, supplies and expenses, and materials and wages used in hot furnace repairs.

Only repairs made while the furnace is in operation are included. Furnace rebuilding cost is included on an accrual basis. The total cost of the rebuilding is charged in equal amounts each cost period throughout the estimated life of the furnace. Adjustments, if necessary, are made at the end of the fiscal year, also, proportions of the steam center cost and general systems cost are included in this department. The total amount is reduced to a cost per machine hour. This is done by a method of "weighting", meaning that the active hours for each type of machine are multiplied by a percentage according to the tons of glass which each type of machine pulls per hour. These percentages are set along with the cost standards each fiscal year, and are based on the previous year's average pull per hour.

Department No. 6 is an indirect center named Forming General. In this center are included all forming costs which cannot be allocated directly to an individual type of machine. Indirect wages, such as supervision, cleaning, etc., and repairs of a general nature are the principal costs, plus the charge from the steam center. The total is distributed directly to the machine centers on a basis of the active machine hours operated during the period.

Departments No. 7 to No. 15 are for the individual types of machines and are naturally direct centers. Costs are made up of the actual amount of gas used for feeder heat, the wages of the operators and help on each machine, and the repair costs involved. The repair costs are charged directly to each type of machine wherever possible and not to Forming General repairs. Also included is a portion of Forming General cost, General

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Systems, Lehr and Mould costs. The grand total for each machine is divided by the active machine hours to bring the cost to a unit cost per machine hour.

Department No. 16, Annealing, is a service center in which all costs pertaining to the operation of lehrs are accumulated. Gas or oil used for heating, wages of the lehr attendants, and repair and maintenance wages and materials are the chief costs. Also a portion of General Systems center is included to cover the electricity used to drive the lehrs. The total is distributed to the various types of machines using the lehrs on a lehr-hour basis. Lehr-hours are the active machine hours multiplied by the number or fraction of lehrs used for each machine.

Finishing Department No. 17 is a direct center and the unit of measurement is the direct labor hour. Various operations are included such as decoration, sandblasting, grinding, filing, cutting tumblers. Expense items in this section are the fuel used for the decorating lehr, cost of screens, etc., for the decorating process, indirect wages such as supervision, cleaning, etc., and the repairs and maintenance of grinders, cutting and paint machines, sandblasters, etc. Along with miscellaneous supplies and expense is included also a charge from General Systems for power. Direct materials include decorating paint, abrasive grains for sandblasting and sand for grinding. Direct labor is the actual labor expended on the finishing operation, and the whole cost of the department is broken down to a cost per direct labor hour.

Department No. 18, Selecting and Packing, is a direct cost center, and the unit is the direct labor hour as in the Finishing Department. Included as expense are the wages of foremen, supervisors, janitors, carton-makers and handlers, reselectors, also the cost of indented felt paper, other packing materials such as tape, glue, etc., all miscellaneous items of supplies and expense, and the repairs and maintenance of packing equipment. Charges from Steam and General System and also the whole cost of the repacking department are included. Direct labor consists of selecting and packing, and attaching fittings. The entire department cost as mentioned above is broken down to a cost per direct labor hour for costing purposes.

Storing Department No. 19 is another direct cost center. Wages paid for storing and repiling ware, both by hand, and with electric trucks, is included. When motor trucks are used for storing, this cost is also included. The manufacture and repair of pallets on which the ware is stored, along with repairs and maintenance of the electric trucks, form a large item of cost in this center. There is also a charge for power from General Systems. Total cost is proportioned to a cost per 100 lbs. ware stored for bottle costing purposes.

Department No. 20 is an indirect center, General and Administrative. The total is distributed to the direct centers pro rata to the total of each center in each period. General and Administrative costs are not proportioned to material values which may be included in any direct cost centers. All items of a more or less overhead nature are included in the General and Administrative center. Sundry, stores, watchmen, moving equipment, travelling expenses, mould and carton transportation, miscellaneous supplies and expenses are included along with repairs and maintenance of buildings and general equipment. Administrative and clerical wages, telephone and telegraph charges, office supplies and equipment, also form a part of General and Administrative cost. A charge from Steam System for heating and from

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General Systems for lighting complete the total. The total of General Administrative does not fluctuate with the volume of operation as do most of the other centers. When a furnace is down for rebuilding, instead of charging the remaining furnaces with the complete General and Administrative expense, it is determined the percentage of the total of the direct centers to the normal or average total. This percentage of the General and Administrative is spread over the direct centers and the remainder is charged to the Furnace Rebuilding Account. The normal or average figures referred to are the total costs of the direct centers when all furnaces are in operation.

Department No. 21, Mould Expense, is an indirect center which closes into the forming machine centers on a basis of active mould hours. Active mould hours are compiled by multiplying the active machine hours by the number of moulds which vary with individual types of machines. Some machines make two bottles in one mould and such dual moulds are multiplied by a standard figure to bring them to the equivalent of single moulds. Charges to Mould Expense Department include the manufacture of new moulds, repairs and replacements of moulds and accessories, direct mould maintenance, wages, small tools, supplies and expense, and repairs to mould maintenance equipment. A charge from General Systems for the power used in mould maintenance is included. When the Mould Expense Department cost is distributed to the Forming Machine centers, a cost complete with moulds is obtained for each type of machine.

Departments No. 22 to No. 25 are for Furnace Rebuilding Costs. A separate account is opened for each furnace. The unabsorbed portion of Steam System, General Systems, and General and Administrative is charged to the down furnace on an activity percentage basis as explained in the General and Administrative center. Direct rebuilding wages and the laid-down value of furnace materials form the major part of the total cost. The total is charged to Furnace Department on an actual basis throughout the estimated life of the furnace. Thus, each period receives an equal amount of rebuilding costs.

Department No. 26, an indirect center is the Repacking and Washing Dept. This includes, as the name implies, all labor of repacking and washing ware, also any washing materials used and a charge from Steam System. The whole total is closed to the Selecting and Packing cost center.

Department No. 27, Shipping, is a direct center. Indirect wages, such as foremen, shipping clerk and shed men, along with any supplies and expense incurred are distributed to the cost of loading packaged ware and the cost of loading bulk ware pro rata to the direct loading wages. Two units of measurement are found, cost per 100 lbs. packaged ware shipped, and cost per 100 lbs. bulk ware shipped.

This completes the departmentatizing of the bottle producing plant for the purposes of bottle costing. The standard rates as arrived at by the foregoing description are revised semi-annually. The units are set usually by the previous year's complete performance. Any major changes in cost which have occurred during the year, such as wage level fluctuations or material value increases or declines are extended back to the beginning of the year so as to have unit rates comparable with those of the future six months. All of the indirect centers are redistributed on a year's basis at revision time so as to avoid overloading any particular forming machine which may have worked

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in a period of high cost only, or which may not have received fair share of cost due to not being in operation in a period of high cost.

Now that standards have been set, it is necessary to apply the standards to the ware produced in order to obtain bottle costs. In the production office, a record is kept of each type of ware on each machine as it is made. Weight of the bottle, speed at which it is running, length of time on the machine and production in gross are recorded daily. The packing department reports on the type and size of package used. From the production reports, as they are called, the cost department can figure the number of gross packed in a machine hour for each type of bottle. This figure is entered on the standard cost sheet form, a specimen of which is enclosed. Also recorded primarily, is the weight of the bottle, type and size of package, and the packed weight thereof supplied from the shipping department records.

From the bottle weight can be figured the cost of batch and mixing by converting the weight in ounces to pounds and multiplying by the batch and mixing standard per 100 lbs.

From the gross produced per machine hour can be figured the length of time in hours or minutes required to pack a gross. By multiplying the result by the machine cost per hour, the cost of melting and machine per gross is obtained.

By a study of the time cards filled in by the Selectors and Packers the number of man hours used to pack each run of bottles is found. This is broken down to man-hours per gross and extended by the Standard Selecting and Packing Rate per hour, giving the Selecting and Packing Cost per gross.

Packages are costed at actual. The prices and quantities are recorded from which they are written off each cost period to the individual types of ware for which they were purchased.

The Shipping Department supplies packaged weights, and by determining the amount of weight in one gross, this can be extended by the storing and shipping standards per 100 lbs. to find shipping and storing costs per gross.

If finishing operations are performed on the bottle the cost is included in the same manner as the Selecting and Packing Cost, by determining the number of man-hours per gross and multiplying by the finishing standard per hour.

Trimmings, if any are used, are included at actual in the same manner as the Package Cost.

A total of the above figures gives the complete cost per gross of the bottle.

Each type of bottle produced during the cost period is listed on a Cost Summary along with the gross packed and cost per gross. By extending each item and totalling the results, the Standard Cost of all ware produced during the cost period is obtained.

The total Standard Cost per period as obtained from the individual bottle costs can be compared with the actual cost incurred during the same period as recorded in the Factory Cost Ledger. Any variance, either plus or minus from Standard, is noted and accumulated period by period throughout the year. This is done by each cost center so it can be seen at a glance in which centers plus variances from standard are obtained, and which centers have minus variances. The variances can usually be explained by fluctuations in

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volume, in material prices or wages, or by increases or decreases in production efficiency.

The following is an outline of the method of applying a variable budget to the Glass Bottle Industry.

The same dictionary of cost accounts is used as in Standard Costing, but each account has its own individual measuring stick. Sometimes, the same unit may apply for several items of cost in one particular department which simplifies budgeting.

From the following information it is possible to carry on a Daily Wage Control and a Four Weekly control of Wages, materials and expense.

Let us follow the departments in the same order as outlined in the Standard Costing Set-up.

The first department, the Steam System, contains such costs as coal, water, coal unloaders' wages, boiler attendants' wages and an account for miscellaneous supplies and expense. Coal is used for two purposes, to prepare steam for building heat and steam for the atomizing of the oil used for furnace fuel. As two boilers are used, one for each purpose, two units are used, one allowing a number of lbs. of coal per degree day which depends on actual temperatures, and, in the case of the boiler on fuel oil an allowance of a number of lbs. of coal per 100 gals. of oil used is made. The allowance for purchased water is rated for either summer or winter consumption. Coal unloader wages are based on a unit of tons unloaded, and the boiler attendants are allowed a fixed amount per day as an engineer has to be on hand at all times. A fixed allowance is made for miscellaneous supplies and expense per period.

In the General Systems Department, we are concerned with electricity cost, power house attendants' wages and miscellaneous supplies and expense. For the electricity budget a chart is prepared based on actual previous performance allowing an amount of money per operated arm hour. As explained previously, Forming Machines have varying numbers of mould arms depending on the type of machine. By multiplying the number of arms on the machine by the hours worked, a unit known as the Arm Hour is obtained. This unit is also used to budget the department's miscellaneous supplies and expense. For the power house attendants a fixed allowance is given per day plus an amount for extra work such as fire inspection or other periodical tasks.

Batch materials are budgeted by pricing the various ingredients needed to prepare 100 lbs. of batch. As 100 lbs. of batch do not make a 100 lbs. of good bottles it is necessary to determine, from previous records, the actual percentage made. With this figure obtained an allowance is given per 100 lbs. good bottles made, or in other words, per 100 lbs. packed.

Batch Mixing Department includes the wages of the batch unloaders, the allowance for which is per ton batch made. Batch mixing direct is a fixed item, as a mixer is on the job at all times. Batch mixing indirect is also a fixed item, but is harder to budget due to the variety of jobs such as cleaning batch house, wheeling and trucking cullet, oiling and greasing, etc. However, from previous experience, budgets are set for guidance. Batch department small tools, supplies and expense are budgeted on the variable unit of tons batch made.

Furnace Department is chiefly concerned with the variable budget for

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furnace fuel. This is done by means of complex charts which are a combination of data from previous experience and from suppliers' specifications on the materials used in the furnace construction. By taking into consideration the kind of fuel used, the design and type of furnace, the colour of glass melted, and lastly, but most important, the age of the furnace, a budget is provided allowing a quantity of fuel per ton glass melted. Furnace attendants, as the job is continuous are on a fixed daily budget.

Machine Repair Department is on a fixed budget, the allowance being determined by a study of several years previous experience. An amount of money per period is allowed for the repair of each type of machine, for the stackers and conveyors, and for the repair of the lehrs. This amount is also divided between wages and materials. As a unit, in the Department, the operated arm is used, but although the budget is not based on this variable unit, it gives a comparison with previous periods or years showing the repair cost per plant activity.

In the Machine Department, the wages of the machine operators are budgeted by the Quantity Weight unit method. The number of gross of money per period is allowed for the repair of each type of machine, for the stackers and conveyors, and for the repair of the lehrs. This amount is also divided between wages and materials. As a unit, in the Department, the operated arm is used, but although the budget is not based on this variable unit, it gives a comparison with previous periods or years showing the repair cost per plant activity.

In the Machine Department, the wages of the machine operators are budgeted by the Quantity Weight unit method. The number of gross of money per period is allowed for the repair of each type of machine, for the stackers and conveyors, and for the repair of the lehrs. This amount is also divided between wages and materials. As a unit, in the Department, the operated arm is used, but although the budget is not based on this variable unit, it gives a comparison with previous periods or years showing the repair cost per plant activity.

The Lehr Attendants are budgeted on a fixed basis as the task is continuous, and the same amount of money should be expended day by day. Fuel for heating the lehrs is charted from previous experience and the allowance is per lehr hour operated.

Our next department is the Finishing Department which includes such operations as filing, grinding, sandblasting, decorating and spraying. Records are kept showing the average man-hours per gross required to perform the above operations on each type of bottle requiring such work.

From a study of these records, taking into consideration the various rates of pay for each job, the direct labor budget of an amount of money per gross is determined.

Finishing indirect which includes foremen, screen cutters, truckers, etc. is a fixed budget determined from previous records and present needs. Materials used in finishing such as sand, paint and emery are budgeted on a percentage basis to the direct labor budget. This percentage is determined from previous experience, and an allowance of an amount of money per gross finished is set. In the same manner, the small tools, supplies and expense of the Finishing Department are handled.

In the Selecting and Packing Department a unit known as the Quantity Weight unit is used. This unit combines the elements of weight of the bottle or size with that of time. Actually, it should require longer to perform the

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Selecting and Packing operations per gross to a large bottle than to a smaller one.

From previous experience a chart is drawn up showing the multipliers necessary to convert the number of gross of a certain size bottle to an equivalent number of Quantity Weight units. As this unit is quite infinitesimal and applies to all sizes and types of war it is possible to set an accurate budget through this means.

Indirect packing materials, such as felt paper, glue, tape etc. are budgeted along with the direct labor by the use of the Quantity Weight Unit. Indirect labor is a fixed item as it includes foremen, truckers, janitors etc. and a daily amount of money is allowed.

Carton making is a variable item and is budgeted per 100 cartons sealed. Attaching fittings, to ware requiring this operation, is done on a man-hour per gross basis. Records are kept as in the finishing operations, and the budget standards are previously attained averages. As a certain amount of re-selecting has to be done, it is better to budget this on a Quantity Weight unit basis rather than on a gross basis, for while the cost per gross may stay constant, the number of gross reselected may become out of line with the ware produced.

Storing Department which includes the labor cost of hand and electric storing, and repiling is a variable budget center.

The unit of measure is per 1000 lbs. stored either by hand or by electric truck as the case may be. Repiling labor is measured per 1000 lbs. stored in total, as it is not desirable to have the repiling cost become out of line in comparison with the storing of ware manufactured. Small tools, supplies and expense of the Storing Department, are also budgeted on the total weight stored.

In the General Factory Section there are a group of accounts which are mainly fixed. The budget is based on the previous years' attained average. Transportation charges on moulds and cartons, travelling expenses, telephone and telegraph, office stationary and expense and general factory supplies and expense are among the items handled in this manner. The Wages Section includes sundry labor, watchmen, first aid, moving and dismantling equipment and the wages of office clerks.

All the above costs do not vary with any particular unit and are thus allowed a fixed amount per period.

The Mould Maintenance Section is budgeted on the variable unit of the single mould hour. This is figured in the same manner as the arm hour previously described, except that dual moulds are multiplied by a fixed percentage to make them on a par with single moulds. Repairs to moulds and the manufacture of new accessories are measured by the single mould hour unit. The indirect workers in this Department such as foremen, truckers, handlers, cleaners, etc. as they must be on the job at all times, and in the same numbers, are allowed a fixed amount per period.

The Maintenance Department is allowed a fixed amount per period for the maintenance of the equipment used in the various Departments of the Plant. This is determined by a study of several years' previous experience modified by the effect of current conditions. Wages and materials are handled separately for each section so a Department by Department Control is maintained as well as an overall control. For purposes of comparison with pre-

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vicious years the Operated Arm Hour is used as a unit. This shows the cost of maintenance in comparison with plant activity as a whole.

The labor cost of Repacking ware from one container to another whenever necessary, is budgeted on the previously attained average cost per gross. The same is true of washing ware, whenever this labor has to be performed.

Shipping labor, by hand and by the electric trucks, is measured on a variable unit of 1000 lbs. shipped by either method. Labor of bulking ware is based on 1000 lbs. bulked. Shipping foremen, clerks and checkers are allowed a fixed amount per period as this work does not vary with the amount of actual shipping. Supplies and expense in the Shipping Department are budgeted per 1000 lbs. shipped by all methods hand, electric truck or bulked.

A separate budget sheet is used for each of the aforementioned Departments.

On it is shown the actual cost and budgeted allowance for each item making up the whole departmental budget. On the four weekly sheets each item, both actual and budget, is carried forward period by period giving a comparison at any part of the budget year. Unit costs, both actual and budget, are also shown for each period and year to date.

Finally, on a Summary Sheet, of which there is one for materials, and one for wages, all the departments are listed with their total actual and budgeted costs. Subtractions are made, and by showing over-budget items in red, it can be seen at a glance how the complete plant is performing in comparison with the budget rates.

The over and under-budget amounts are accumulated period by period so a year to date comparison is also obtained. By totalling the departmental actual and budgeted amounts, a complete plant total is arrived at, both for wages and materials.

However, the four weekly budget sheets are only a summary of what has happened in the preceding weeks. The Daily Wage Control Budget, which is prepared day by day, can point out over and under-budget items right at the time such conditions are occurring. A complete distribution of the payroll is made from the time cards each day in order to obtain the actual costs for the Daily Budget. Sheets are made out for each Department, a copy of which is given immediately to the Department Head, and a complete set given to the Superintendent. Thus any variations from budget can be immediately accounted for and controlled.

Unfortunately it was impossible to reproduce the various forms submitted.

EDITOR.

Purchase Under a Costing System

By A. J. GAIRNS, F.F.I.A., A.A.I.S., A.C.A.A.

Reprinted from the Australian Accountant

Most manufacture consists at its outset of the processing of raw material in some form or other and, in order to provide accurate and useful costs, a careful review of the whole purchasing system is necessary. Of course, purchasing does not entail only the obtaining of raw materials, parts, etc., but includes as well the multiplicity of services rendered to modern business in these days, such as power, fuel, light, auditing and accounting, legal advice, maintenance, inspection and so on, as well as supplies of a service nature. All these must be organized and controlled and segregated from accounting purposes into their respective avenues of cost.

To begin the discussion, one may assume that proper merchandising methods are in operation to control and supervise buying and check the receipt of the goods at the time of each delivery. Buying should be directed, if possible, by one officer of the organization, or, at the most, by one section, such as the factory office under the factory production manager or by the general office under the secretary. If several persons, such as departmental foremen, are all taking an individual part in this matter, confusion and overlapping are sure to result. Even if the set-up entails special buying by these officials, the actual order should be handled through the channels mentioned above. Correct order forms are important, and, to ensure accuracy, these should be typed and copies distributed to the departmental heads interested. It is, of course, generally recognized that in order to provide purchase control, no goods should be obtained without the issue of an official order and further that the order numbers should be referred to on the suppliers' invoices. The purchasing officer should be deputized by the public officer to sign any sales tax certificate required on such orders, and, although this important matter can only be mentioned here, it must be realized that a very intimate knowledge is required by this official of the intricacies of sales tax regulations; in particular, those applying to aids to manufacture.

Checking Goods Inward

It is vital to the success of the costing system that goods inwards be carefully checked and recorded and that all differences in count, or defects in quality, be notified to the suppliers and credit notes obtained. Even although delivery tickets are used, a full and complete daily record should be kept of all inward goods, and, in order to assist this, goods should be received at one delivery point only and not accepted at all parts of the factory. This record is invaluable in settling disputes regarding deliveries and is also helpful in completing stock records where invoices are delayed in reaching the office, as is often the case these days.

The importance of unit recording stock control systems is now generally recognized, and it is of little use carefully checking goods into store unless their subsequent movements are traced until they are absorbed into production. Most firms have a proper system with regard to raw material and this should be extended, if possible, to the "sundry" lines throughout the

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organization. A fixed aim should be to see that store facilities are constantly improved and the ideal—a central store—eventually achieved. Where material is scattered throughout the factory, it is very difficult indeed to control it properly, and the opportunities for misuse and pillage are so much greater.

In connection with buying generally, it is necessary to-day to have some fixed buying policy. For instance, one firm may lay down as a general policy, wherever possible, to have on hand at least two years' supply of its requirements. Capital commitments may not permit this length of time in all cases, but the point is that a policy which is best suited to the requirements of the times is fixed and continued attempts made to adhere to it. The subject of policy might include also the question of quotations. It should be laid down that, in all cases, a quotation must be obtained before ordering. Just whether this is wise or convenient in all concerns is a matter for each individually, but there is no doubt that this method is the only certain one of obtaining competitive prices.

Selection of Methods

Once the nucleus of a system is established, the main concern must be to select and operate a suitable system of handling the accounts. The first problem will be to decide whether purchases can be handled on the basis of the monthly statement or whether necessity demands that each invoice be considered separately. This will depend entirely on the costing system, particularly with regard to the length of the accounting periods. These may be on a monthly basis, fortnightly, weekly, or whatever other time is suitable. Another consideration is the volume of accounts themselves, and whether the cost accounts are to be subdivided—portion to be incorporated in the cost ledger. If the latter is necessary, the accounts must be treated on an invoice basis, each single transaction being allocated to an account and posted individually. This is imperative in any case where the accounting system is on any other basis but monthly. In the invoice method it is necessary to deal with each transaction up to the end of the accounting period and, in such a case, in view of the necessity of paying each account monthly as usual, there is often the necessity to balance as frequently as the total of the periods in the year plus twelve monthly balances. In the case of four-weekly periods, this would mean twenty-five balances each year. Some firms overcome this by paying creditors on a four-weekly basis, but this is not popular, as a greater degree of check is secured by tying the creditors' accounts in the purchase ledger with their monthly statements of account.

In costing, allocation to the correct account is very important and two officers usually collaborate in this regard. One of these, obviously, is the cost accountant and the other may be either the secretary or the production manager. Some numbering system must be in operation as the invoices must be filed in order of date of receipt of goods so that this serial number is necessary in order to locate them quickly. The allocation referred to above must indicate firstly the ledger—either general ledger or cost ledger—in which the account is to be placed, and, secondly, the name of the account. It is a good plan to use a rubber stamp which will provide spaces for this allocation as well as room for checks such as receipt of goods, inwards book folio and invoice clerk's initials signifying check of extensions, entry, etc.

The need for a purchases journal will again depend on the ledger set-up.

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It is usual, in most factories, for the bulk of purchases to be factory items, and, for this reason and the fact that cost ledgers are often operated on a manual basis, a purchases journal is used. However, this is not essential, and, where machine accounting is in operation with the cost cards in a separate portion of the ledger, the posting of factory purchase accounts can be handled as usual through proof sheets. All are posted to the debit of cost ledger control account in the machine ledger and credited to suppliers' accounts in the creditors' ledger, such being controlled by the usual control card in the general ledger. The items are "picked up" in the cost ledger and simply debited to the appropriate cost ledger material, expense and service accounts.

Special Costing Routine

It is essential that invoices be tied up exactly with the inwards records. This is important in order to determine the proper charges to costs for the period. It may be mentioned here that invoice dates do not always correspond with dates of delivery as, in many establishments, the invoices are prepared next day, or on some subsequent occasion, thus necessitating a constant check with the inwards records.

Another necessity is to speed up receipt and handling of invoices relating to goods purchased during the accounting period. Where no requirement other than that of paying creditors within the usual thirty-day term is present, invoices may not be required until some time after delivery. This is not so in costing, and each supplier must be impressed with the need for rendering his account as soon as possible. If this is not attended to, much trouble ensues in closing off the accounts and presenting the cost results.

Since raw material constitutes one of the main items purchased in any organization, costing usually requires that these receive special attention. Often standard prices are set for the main ingredients, and it is necessary to obtain a figure for total usage in these main lines. Thus, in an engineering firm, a classification of raw materials might be made into pig iron, steel, bolts and nuts, etc., simply in order to control the usage of these materials. This figure is obtained by means of the periodical stocktakings necessary under a costing system. An account for raw material stocks appears in the cost ledger dissected into the necessary headings. Usage for the period is obtained, after bringing the closing inventory to account, and debited to "materials used" account to be charged out to departments or production accounts as required by the costing system.

New Classifications

It is necessary in a costing system to determine the function of various purchases and to apply the proper term to such goods. In the first place, we have raw material divided perhaps into certain classes as explained above. Then, in most factories, other lines are brought in simply for inclusion in the manufactured article without any alteration in form or substance in the process. An excellent example of this is the tinned fruit container or the axle on which is moulded a rubber wheel. These are "buy-ins" or "outside purchases" and must be designated as such. The importance of this is seen in the decisions of many concerns to exempt from overhead charge any item which is not fully processed or made up by them in the course of business. In other words, a cannery should charge its "burden" on the fruit, jams, etc., it makes and not on the cans bought in. These

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purchases must be recorded separately to avoid confusion with raw material and labor costs on which overhead is charged.

Again, certain goods are bought in merely to sell again without changing their form. They do not go near the factory, but are handled by the store. An example of this might be a line of dried fruits handled by a cannery. Such goods enter the store in bulk, may or may not be repacked, and are sold again on a profit basis without any charge for factory overhead. It is usual to include in the cost the full administrative overhead, although often a store handling charge, which includes only a portion of administrative expenses, is added instead. Various names, such as "commission goods," "merchandise," etc., are used for these purchases. Incidentally, the cost of these is posted to the debit of "finished goods stock" account and included in the amount transferred from this account to "cost sales." The "finished goods stock" account may be included either in the general or the cost ledger, but it is usually found in the latter, as the total factory production must be transferred to the debit of this account.

Purchases by service departments, such as the engineers or the laboratory, must be debited to these sections, as, after labour cost and a portion of overhead expenses are added to these departments, their total cost is redistributed, on some predetermined basis, among the productive departments.

Buying Variances

The matter of standard costs for raw materials has been mentioned previously. These are fixed in order to overcome the necessity of revising cost prices whenever a rise or fall occurs. In order to show correct departmental results in the costing figure it will be necessary to make an adjustment whenever the actual price varies from standard. This is usually achieved by means of buying variation account which records these differences. Some costing systems do not require this but simply show the actual result in the cost accounts. For instance, in Department A, which is the mixing or initial processing department, a loss may be shown on material. This may be due to many factors—buying variances, losses on processing, pilfering, evaporation and many other causes. No attempt is made to segregate each, but the result is dealt with as a whole.

On the other hand, if it is possible to extract this difference on buying, there is one less factor to cause such an adverse result, thus giving a greater possibility of balancing the account. It is quite a good plan to deal with each variation from standard at the time of handling the invoice, thus avoiding the necessity of referring to the invoice again at the end of the period. The amount of the difference, favourable or unfavourable, is noted and journalized at the end of the period, thus leaving the stock account at standard cost.

Of course, variations from standard may be dealt with on the issue of the goods. This has much to commend it, as it enables any variation to be charged more equitably to the financial period concerned than would be the case under the buying variance system. As an example, consider a substantial purchase in one period at a considerable amount over standard. This unfavourable variance is written off and adversely affects the costing figures for that period, whereas, if the purchase had been debited to stocks on issue to the manufacturing departments. It may be stated finally that these large

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buying variances can be spread more equitably with its share on the reserve method. The difficulty here, of course, is to fix an amount for a period ahead as, obviously, purchases and purchase costs are by no means fixed and certain.

Stock Sheet Valuation

The stock on hand of raw materials, outside purchases, engineering supplies, stationery, packing, etc., should not be priced until the last of the invoices has been received and posted. Of course, if buying variances are written off, stocks will be valued at standard, so that this does not apply to such lines. In other cases, reference should be made to the cost of recent purchases, and stock should be valued at actual cost on the assumption that the "first in first out" principle applies. If possible, actual quantities bought should be identified and correctly priced in the stock sheets. Care should be taken not to increase the cost figure against a line simply because the latest shipment has increased in cost. This would mean inflation of stocks and fictitious profits. If the new items cannot be identified and costed separately, costs should be averaged and priced accordingly. Where stock is mixed up—old stock with new—we assume that the old lot will be used first and price it accordingly.

As a final word on this subject of purchases and costing, it is considered part of the Costing Department's duties to make some record of the cost price of all goods bought, as a check on current prices. This is best kept in a separate record, probably on the section principle, or perhaps simply alphabetical. All costs—giving purchase date, supplier's name, amount bought and landed cost—are recorded on a tabular system or on cards in such a manner that all costs are comparable at a glance and thus subject to supervision. All the lines handled by the organization are entered here, making it a complete buying record. I would even record standard costs and their variations and alterations in order to show their cost history.

Some Psychological Aspects of Time Study

By R. E. MASKELL, A.I.C.A., A.F.I.A., A.A.I.S.

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I have often considered that some writers on Time and Motion Study have overlooked the very important fact that the human being is much more than a mere machine—however close the analogy in some respects.

That Time and Motion Study has its place in industry is undoubted, but I am sure that if managements attempted to inflict some of these ingenious plans on Australian workmen much dissatisfaction would be displayed. The Australian temperament is normally characterized by its detestation of tyrannies of any description and as the Time and Motion innovation, if mishandled, is likely to lead to a serious disruption of industrial relationships, I believe it is extremely important to place in the forefront of our consideration, at this time, some of its psychological aspects.

SOME PSYCHOLOGICAL ASPECTS OF TIME STUDY

Workers' Co-operation is Essential

It must be admitted that these methods of "work and time analysis" do hold out a possibility—almost a temptation, to take advantage of the worker and to exploit him by demanding a greater exertion from him in return for a negligible increase in his possible earnings.

It cannot be too strongly emphasized that the willing and wholehearted co-operation of the worker is absolutely essential to success. In introducing time-study for the first time, the worker must be made to understand clearly what it is all about; not only during the actual "time-study," but also afterwards when the consequent changes are put into effect. If the worker is left in ignorance as to the purpose of these new methods and ideas, then his natural and immediate reaction is one of resentment; and you can achieve nothing while that feeling predominates. If the worker is induced to give his willing co-operation in the work, then he is in all fairness entitled to share in the results.

This means, of course, that any economy effected by the new methods must be shared by him; the price of the job, or the "times allowed" must be so fixed to give him a reasonable chance to earn a higher wage. Any attempt on the part of a management to evade this obligation and to pocket all the benefits for themselves can result in nothing but discontent among the workers which in turn will decrease production and thus offset anything gained by the new method.

Beware of Fatigue

Again it must be remembered that working under whatever new methods your "work analysis" may suggest, the individual worker will be under a greater and more continuous strain, simply because he will be more continuously occupied and will be putting more actual effort into each hour than before.

If this fact is overlooked, and no provision made to prevent it, then excessive fatigue must inevitably follow. This will mean that costs will rise instead of fall and your analysis will have achieved less than nothing!

There is an optimum point in every worker's curve of effort. Go beyond this and his efforts decrease—not by desire or through slackness on his part, but because fatigue compels him, even against his will, to slow up. This being so, it is unwise to attempt to extract the last ounce of effort, and if you try to exploit the worker by endeavouring to get more work out of him for the same wages, then you will deserve failure—and you will assuredly get it.

Time Analysis

Now that those few pointed but necessary remarks have been made, we can consider the question of making a time-study of the job from which we have already prepared the production plans and working plans.

The actual taking of time-studies presents very little difficulty in the usual way, but it does call for close attention, alertness and keen powers of observation on the part of the observer. Moreover, he needs to be something of a diplomat, for the normal and natural reaction of the worker towards an observer of his work is one of resentment and distrust—even of fear. If this emotionalism—for that is what it is—is not recognized and accounted for, then the result of your time-study will be misleading.

For this reason, the time-study man must not only be familiar with the

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work involved and his own particular job of serving and timing fairly and accurately; he must also be able to get on the right side of the worker under observation, to allay his mistrust, to win his confidence and co-operation. He must be a good "mixer," able to speak easily and conversationally with the worker and to put him at his ease. To be obtrusively tactful and polite will have the reverse effect to that intended. The time-study man must be able to get the worker interested in the whys and wherefores of the time-study, for only in that way will he have his attention voluntarily drawn to things which might otherwise escape him.

Secrecy Doesn't Pay

There must be nothing furtive or secret about his work, either; his actions must be open and frank and perfectly "above-board," and he should at all times evince a spontaneous readiness to explain what he is doing, what he is going to do, and why he is doing it—even if the questions are asked out of sheer curiosity.

The successful time-study man does not begrudge the time spent in cultivating a feeling of good-fellowship between himself and his subject, for he knows that such time is amply rewarded by the knowledge that such a feeling is essential to accuracy in his work and is the means of obtaining helpful assistance which is unobtainable by any other means.

No apology is offered for dealing with these matters at some length, for upon the time-study man's figures all things depend. Inaccurate time-fixing leads to trouble and discontent among the workers, loss of profits, loss of orders, slowing-up of production and many other evils of that nature, and again it is repeated that accuracy in time-study is impossible wherever there is distrust or lack of confidence between the time-study man and the worker he is observing.

Many time-studying men who have learnt the truth of these matters from hard experience still manage to fall down on the job, but for quite another reason. They fail to realize that they must also keep on the right side of the foreman of the department concerned! This is not so simple as it seems, for he is, after all, "poking his nose into other people's affairs," or so the foreman is likely to think! He is doing work which the foreman has always reckoned to be part of his job (largely by instinct rather than scientific analysis); he is butting into and altering methods and matters for which the foreman has been responsible in the first place and with which he is probably quite satisfied. There is therefore a ready-made tendency for the foreman to look upon the time-study man as an interfering nuisance.

Placate the Foreman

As the foreman, if so inclined, can make matters very awkward indeed, it is necessary for the time-study man to remove these conservative ideas, and he can do this by carefully explaining that he is there solely for the purpose of making his work easier, not merely to interfere and find fault. He should point out that all his specialized experience and all his time is being devoted to just one small part of the foreman's responsibilities, and consequently it is plain commonsense that he is able to go deeper into the work and thus find out things which the foreman could not hope to do with anything like the same accuracy.

It is worse than useless to take up the "superior person" attitude, criticizing and carping! The time-study man is there to help the foreman and

SOME PSYCHOLOGICAL ASPECTS OF TIME STUDY

he needs considerable tact in his dealings with him. In short, the time-study man must be on really good terms with both the foreman and the worker: if he cannot achieve this, it would be far better if he found some other avenue for his talents.

Having safely got over these fences the time-study man is up against another difficulty, and this time it is a very real one. It is—"what particular type of worker should I observe?" That eminent pioneer of scientific management, Mr. F. Taylor, used to select for his observations the most highly-skilled worker available in the particular type of work he wished to study.

He did this because it was his opinion that the best man was so much more easy to recognize than a man to be defined in any other way. This is probably true, for any foreman will quickly tell you whom he considers to be the best worker in his department. But the "observed times" arrived at by utilizing this highly-skilled worker, obviously could not be used as "standard" time applicable to all the workers engaged on that particular job, and it was necessary to modify them considerably so as not to penalize the slower or less highly-skilled workers. And this is where Taylor came up against a difficulty. The degrees of skill between the best worker and the worker only just good enough to warrant employment were vast and varied, and to adjust the "quickest possible time" in such a way as to render it fair to the entire gamut of workers from the best down to the worst so that all could earn a reasonable wage, proved to be practically impossible.

The "Average" Worker

Then came the idea of timing the "average" worker, which obviously was a sound idea. But how to define the "average" worker? And how to recognize him when defined? The best man, as Taylor found, usually shines out above all others; equally the worst man is usually obvious, but to pick out an "average" man presents difficulties which are not obvious at first sight.

One method of arriving at an "average" performance is to study a large number of workers and to take the average of all the results obtained, but this is a cumbersome and costly method, so costly in practice that any benefit gained in the process is automatically lost in the cost of the study! The importance of this matter is apparent. If you cannot determine what is an average performance for a worker (an average, he it remembered, that is acceptable to the whole of the workers as fair and equitable) then the whole purpose of time-study is futile and useless, for if you cannot determine how long it should take an average man to do a job, then you cannot hope to fix times which will offer the necessary inducement to all the workers to increase their efforts—which, after all, is the underlying purpose of all time-study.

Guess-work is no good, for you might easily select a man who is some degrees above this elusive "average" and by fixing your times on his performance you find very quickly that many of the workers cannot earn a bonus, with the result that trouble and failure to achieve any speed-up of production will ensue. On the other hand, you might just as easily contrive to select a worker some degrees below average. Then you find that your "times allowed" are excessive and that some of the workers are earning absurdly high bonuses. Consequently, the general method in use is to effect a compromise by selecting one or two workers whom the foreman desig-

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nates in his judgment as "average," observing these workers, and then adding to the times arrived at an arbitrary percentage which might (according to the management's policy) be anything from 20% to 75% or even more. Obviously this method is nothing more than a rough-and-ready compromise, but efforts have been made to arrive at a more scientific conclusion.

The "Lowry" System

One such method is explained at length in an American book entitled "Times and Motion Studies and Formulas," by Lowry and others. This method represents a degree of complexity which, in the writer's opinion, renders it impossible for the ordinary workman to understand, and consequently cannot be considered suitable for use in any but a few specialized cases. Nevertheless, as a matter of general interest it might be as well to give a brief explanation of this system, for it is probably the most ambitious attempt yet made to solve this problem of the "average" worker.

The author of this system claims that time-study is affected by four main considerations, which are (a) skill, (b) degree of personal effort, (c) consistency of effort and (d) conditions under which the work is done. He then proposes a schedule of fixed allowance percentages which are to be added to or deducted from the figure by which the observed times are modified. The table of factors suggested by the author are reproduced in Fig. 1.

Skill Factor			Effort Factor		
A1	+0.15	Superskill	A1	+0.13	Killing
A2	+0.13		A2	+0.12	
B1	+0.11	Excellent	B1	+0.10	Excellent
B2	+0.08		B2	+0.08	
C1	+0.06	Good	C1	+0.05	Good
C2	+0.03		C2	+0.02	
D	0.00	Average	D	0.00	Average
E1	-0.05		E1	-0.04	
E2	-0.10	Fair	E2	-0.08	Fair
F1	-0.16		F1	-0.12	
F2	-0.22	Poor	F2	-0.17	Poor

Consistency Factor			Conditions		
A	+0.04	Perfect	A	+0.06	Ideal
B	+0.03	Excellent	B	+0.04	Excellent
C	+0.01	Good	C	+0.02	Good
D	0.00	Average	D	0.00	Average
E	-0.02	Fair	E	-0.03	Fair
F	-0.04	Poor	F	-0.07	Poor

Fig. 1. The "Lowry" table of adjustment factors in time-study for determining "Average" performance.

When a motion is being observed, each of these four main considerations is taken into account (according to the judgment of the observer, of course) and they are utilized in the following manner:

The work is judged to have been carried out with, say:

Good Skill (C2)	+0.3
Poor effort (F2)	—17

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SOME PSYCHOLOGICAL ASPECTS OF TIME STUDY

Fair consistency (E)	—02
Fair conditions (E)	—03
	<hr/>
	—19

Deducting this final figure of —.019 from unity, we arrive at a figure (which the author terms the "levelling factor") of 0.01. Assuming that the average of the time-studies taken amount to three minutes on this particular motion, then the "standard" time becomes $3 \times 0.81 = 2.43$ minutes.

The Variable Factors

It will be appreciated that this system does attempt to take into consideration not only the job and the degree of skill used, but also the degree of effort exerted by the worker, the conditions under which the worker performs, and the apparent consistency of effort (i.e., whether the work could be continued over a period at the same rate of effort). Consequently it offers a carefully thought-out attempt to determine an "average" performance, but as already mentioned, such systems as these cannot be recommended for general use, principally because of the impossibility of explaining to the ordinary worker exactly what is being done, how the "times" are arrived at, and, therefore why he is able, or not able, to earn a reasonable bonus. If you cannot do that, then your system is no more than a dangerous experiment.

From the foregoing, it will be realized that the successful time-study man must not only be experienced in the work involved and the methods of "timing," but must also have the gift of keeping himself on good terms with all concerned and must have the ability to make important judgments. He must be able fairly to estimate how much effort is being put into the job under observation, whether the worker could keep up his present rate of effort, and so forth. Upon his accurate judgment of these things depends the whole success or failure of what is now termed "scientific management."

The time-study man's job is by no means an easy one, but it can be exceedingly interesting and satisfying. It depends upon the man himself—whether he is prepared to study not only the practical side of the job, but the psychological side too, for he must be as much a psychologist as he is an accountant-engineer.

Examinations

Fundamentals of Cost Accounting

PROBLEM 1 (8 Marks)

Name four of the most important and more commonly used methods of determining rates for the distribution of productive department overhead to production.

PROBLEM II (12 Marks)

- Draw up a stores ledger sheet
- Enter thereon the following information and transactions concerning item PM 11, using the average cost method of valuing materials used.
March 1. Balance on hand 400 units @ \$1.50 each—\$600.

EXAMINATION PAPER

2. Ordered 250 units, purchase requisition No. 503, purchase order 806.
2. Issued stores requisition 806 No. 1075, 150 units.
3. Ordered 150 units, purchase requisition No. 504, Purchase order No. 807.
4. Received 250 units, Purchase order No. 806 @ \$1.54 ea.
6. Ordered 300 units Purchase requisition No. 505, Purchase order No. 808.
7. Issued stores requisition No. 1076, 350 units.
8. Received 150 units, Purchase order No. 807 @ \$1.50 ea.
9. Issued, Stores requisition No. 1077, 200 units.
10. Received 300 units, Purchase Order No. 808, @ \$1.56 ea.
11. Issued, Stores requisition No. 1078, 200 units.

PROBLEM III (20 Marks)

The Moore Products Corporation manufactures a product in three processes designated as processes A, B and C. There were no operating inventories and during the month of January, 1943, the expenses of each process were as follows:—

	Process A	Process B	Process C
Direct Material	25,000	14,000
Direct Labor	16,000	18,000	6,000
Fixed Charges	1,800	4,000	2,000
Apportioned Charges	2,200	3,600	2,425

During the month 3,000 units were started in process A. These were all completed and transferred to process B. In process B all units were completed and 2,600 units were transferred to Process C. In Process C 2,400 were completed and transferred to Finished Goods. The remaining units in process were estimated to be $\frac{1}{2}$ completed.

Prepare a cost statement showing:—

- (a) The cost per unit in each process.
- (b) The cost of each process.
- (c) The total accumulated cost after each process.
- (d) The total accumulated unit cost after each process.
- (e) The value of the inventory of work in process.
- (f) The cost of finished product transferred to Finished Goods.

PROBLEM IV (18 Marks)

The Smellworks Manufacturing Company operates two service departments; No. 1 Power, No. 2 Stores and three productive departments A, B and C. Charges for the month were:—

1. Indirect Labor—productive departments	900
Rent	565
Light	340
Insurance on Plant and Equipment	395
Unallocated sundry expense—prod. depts.	200
2. Direct Labor was incurred as follows:—	
Department A	1,650
Department B	630
Department C	420
3. Service departments labor amounted to:—	
Department 1	327
Department 2	435

COST AND MANAGEMENT

4. Service Departments expense amounted to:—
- | | |
|--------------------|-----|
| Department 1 | 443 |
| Department 2 | 325 |
5. Direct Material issues were:—
- | | |
|--------------------|-------|
| Department A | 2,300 |
| Department B | 1,700 |
| Department C | 1,000 |

The following information is available:—

Dept.	Sq. Ft. of Floor Space	No. of 200 Watt Lamps	H.P. Hrs.	Value of Macy. & Equipment
1	7,500	25	18,000
2	6,000	18	3,000
A	12,500	43	960	20,000
B	14,000	39	540	16,000
C	16,500	45	470	22,000

Required:

Prepare an expense distribution sheet showing in detail (to nearest dollars):—

- (a) The manufacturing expense apportioned to each department and the basis of distribution used.
- (b) The apportion of service department costs to productive departments.

PROBLEM V (42 Marks)

On March 1, 1943, the trial balance of the Bishleigh Corporation was as follows:—

Cash on hand and in bank	5,800	
Accts. Receivable	27,740	
Stores	4,880	
Work in Process	5,400	
Finished Goods	8,700	
Plant and Machinery	37,200	
Accounts Payable		24,270
Accrued Payroll		1,600
Reserve for Deprec. of Plant & Macy.		15,210
Reserve for bad debts		825
Capital Stock		42,000
Surplus		5,815
	89,720	89,720

During the month of March the following transactions took place:—

- | | |
|---|-------|
| (a) Materials purchased for stores | 6,000 |
| (b) Materials issued from stores direct | 4,600 |
| indirect | 1,210 |
| (c) Materials returned to supplier from stores | 480 |
| (d) Total payroll for month—direct | 6,780 |
| indirect | 630 |
| (e) Wages paid during month | 7,300 |
| (f) Sundry expense incurred during month | 1,890 |
| (g) Selling & Administrative exp. incurred during the month | 4,650 |

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- (h) Applied selling and administrative expense was charged during the month at the rate of 20% of sales.
 - (i) Accounts receivable collected 17,400
 - (j) Accounts payable paid 9,950
 - (k) Depreciation to be provided for the month on plant and machinery at the rate of 10% per annum.
 - (l) Spoiled work costing \$275 was scrapped with a value of 30
 - (m) Manufacturing expense applied to production 4,100
 - (n) Work in process inventory March 31st, after adjustment for manufacturing expense (see note) the balance of the work has been completed and transferred to finished goods 4,745
 - (o) Cost of finished goods sold during the period 17,300
- Sales were made at a mark-up of 30% over cost as above.

REQUIRED:

- (a) General Ledger entries in journal form for each transaction above. Letter the entries to correspond to the transactions.
- (b) Manufacturing, Trading and Profit and Loss Statements for the month of March and Balance Sheet as at March 31st.

NOTE.

Under or over-applied manufacturing expense is to be adjusted in total to the manufacturing expense section on the Manufacturing Statement. No adjustment is to be made to inventories.

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